

Eliminating Adverse Impacts of Low Dissolved Oxygen in the Sound

The Long Island Sound Study identified low dissolved oxygen (hypoxia) as the most significant water quality problem in LIS. Long Island Sound's waters comprise the largest single habitat for living marine resources in the watershed. Since 1990, EPA and the states of Connecticut and New York have implemented a phased program that first capped, and subsequently reduces human-caused nitrogen loads to LIS over a 15-year period.

CCMP Strategy:

The CCMP identified a five part strategy to address the elimination of adverse impacts of low dissolved oxygen in the aquatic habitat of the Sound: 1) reduce nitrogen from sewage treatment plants (STPs) and other point sources; 2) reduce nitrogen loads from nonpoint sources; 3) continue management of hypoxia; 4) fund implementation of hypoxia management plans; and 5) monitor and assess hypoxic conditions in the Sound.

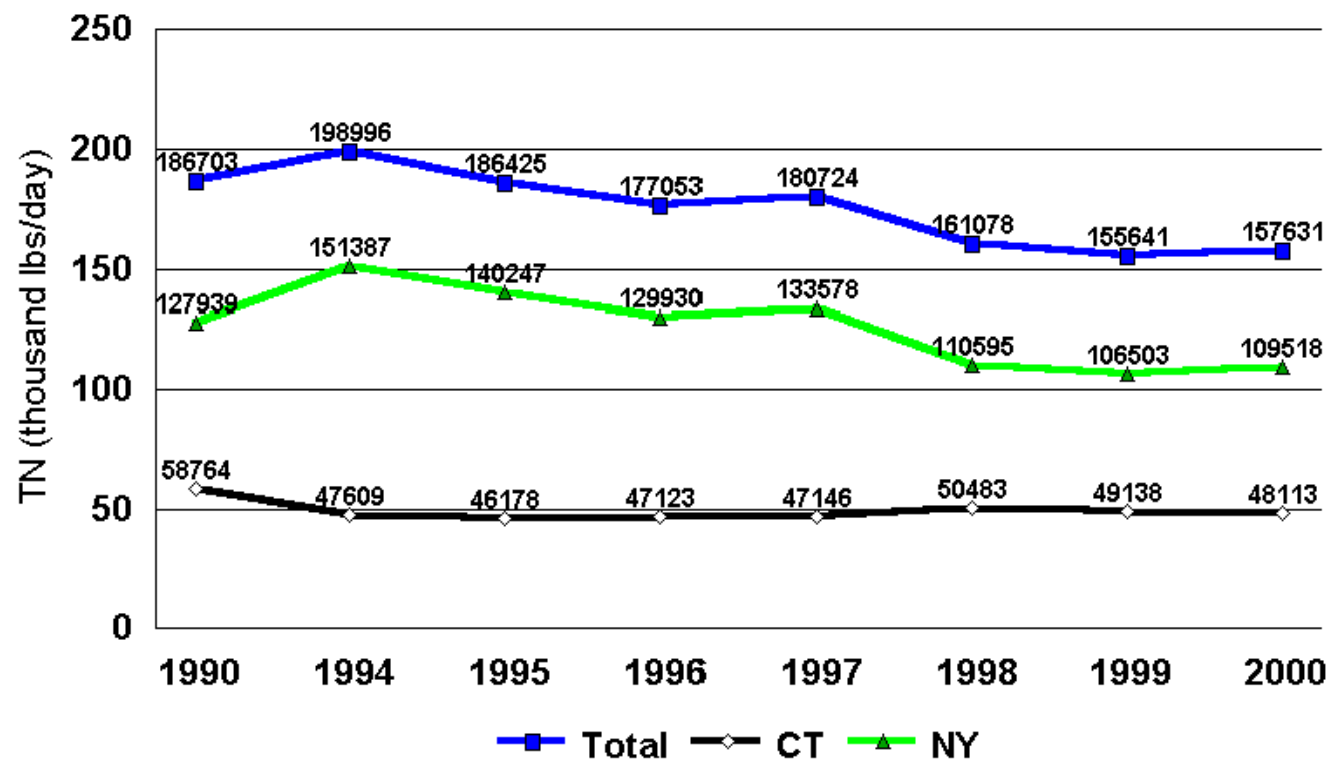


2000 Highlights:

- The states of New York and Connecticut held a series of public meetings in 2000 to gather public comments on the proposed waste load allocations to be included in the TMDL. Both states provided written responses to the public comments that were included with the TMDL submission.
- The states of New York and Connecticut completed the Total Maximum Daily Load (TMDL) for nitrogen and submitted the TMDL for EPA approval in January 2001. The TMDL is consistent with the July 1998 *Phase III Actions for Hypoxia Management*, the LISS bi-state agreement calling for a 58.5 percent reduction in human-caused (anthropogenic) nitrogen loads to the Sound over a 15 year period beginning in 1999. EPA approved the TMDL in April 2001.
- The estimated nitrogen load from STPs in the LIS drainage basin that entered the LIS in 2000 is approximately 158,676 lbs/day, a decrease of over 28,000 lbs/day from 1990 levels. This is a slight increase from the 1999 levels due to more accurate reporting by the states.
- New York's 2000 point source nitrogen loading was 110,563 lbs/day, compared with 105,759 lbs/day in 1999. Connecticut's point source nitrogen loading was 48,113 lbs/day in 2000 compared with 49,138 lbs/day in 1999. Figure 1 shows the total point source nitrogen load and the trends in New York and Connecticut since 1990. The total estimated nonpoint source load to LIS is estimated to be 27,937 tons (1999 figures), a reduction of 9,110 tons from the peak year of 1991 at 37,047 tons.
- In 2000, the maximum area and duration of dissolved oxygen (DO) levels less than 3 mg/l in LIS was 173 mi² and 36 days. This was a somewhat larger area than the 1999 hypoxic area of 121 mi², but the duration of hypoxic conditions was somewhat less than the 50 days recorded in 1999. Figure 2 shows the timing and duration of hypoxia in LIS since 1987.
- The City of Waterbury's new STP came on line in 2000, increasing its nitrogen removal capacity by 75 percent, to 4mg/l. The new plant has capacity for processing 52 MGD and up to 82 MGD of primary effluent for storm water overflows.
- As of 2000, 19 municipal STPs in Connecticut have completed nitrogen removal projects totalling over \$250 million; 5 STPs currently have nitrogen removal upgrades in progress totalling \$80 million; and 6 STPs currently are under design for nutrient removal with design grant costs totalling over \$116 million. (See Figure 3)

Figure 1

Point Source Nitrogen Load to Long Island Sound

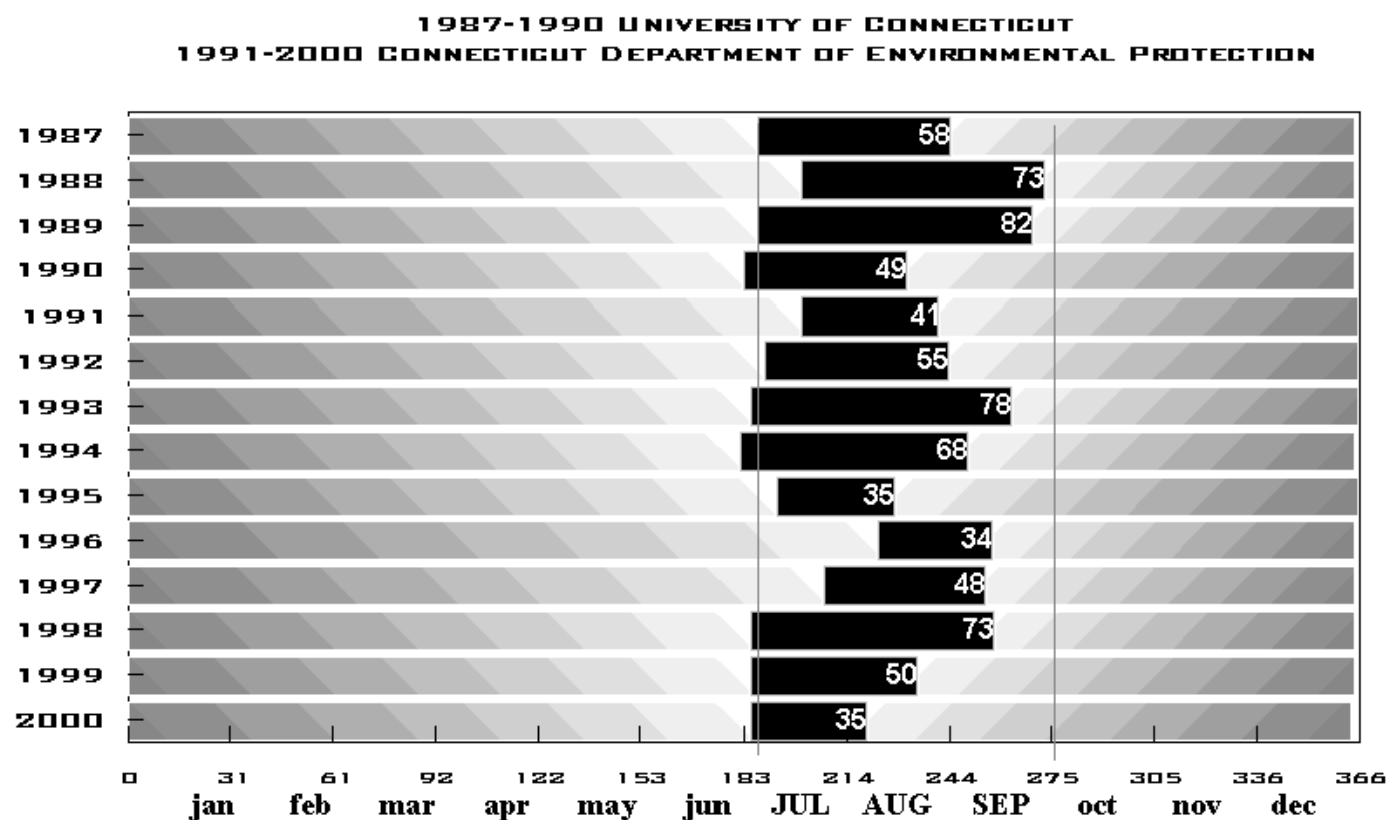


These estimates include 98 municipal, 4 state, 3 private, and 4 industrial discharges = 109

CTDEP adjusted its data in 2000 to include estimates for STPs that did not report nitrogen loads in the past.

Figure 2

Timing and Duration of Hypoxia in Long Island Sound



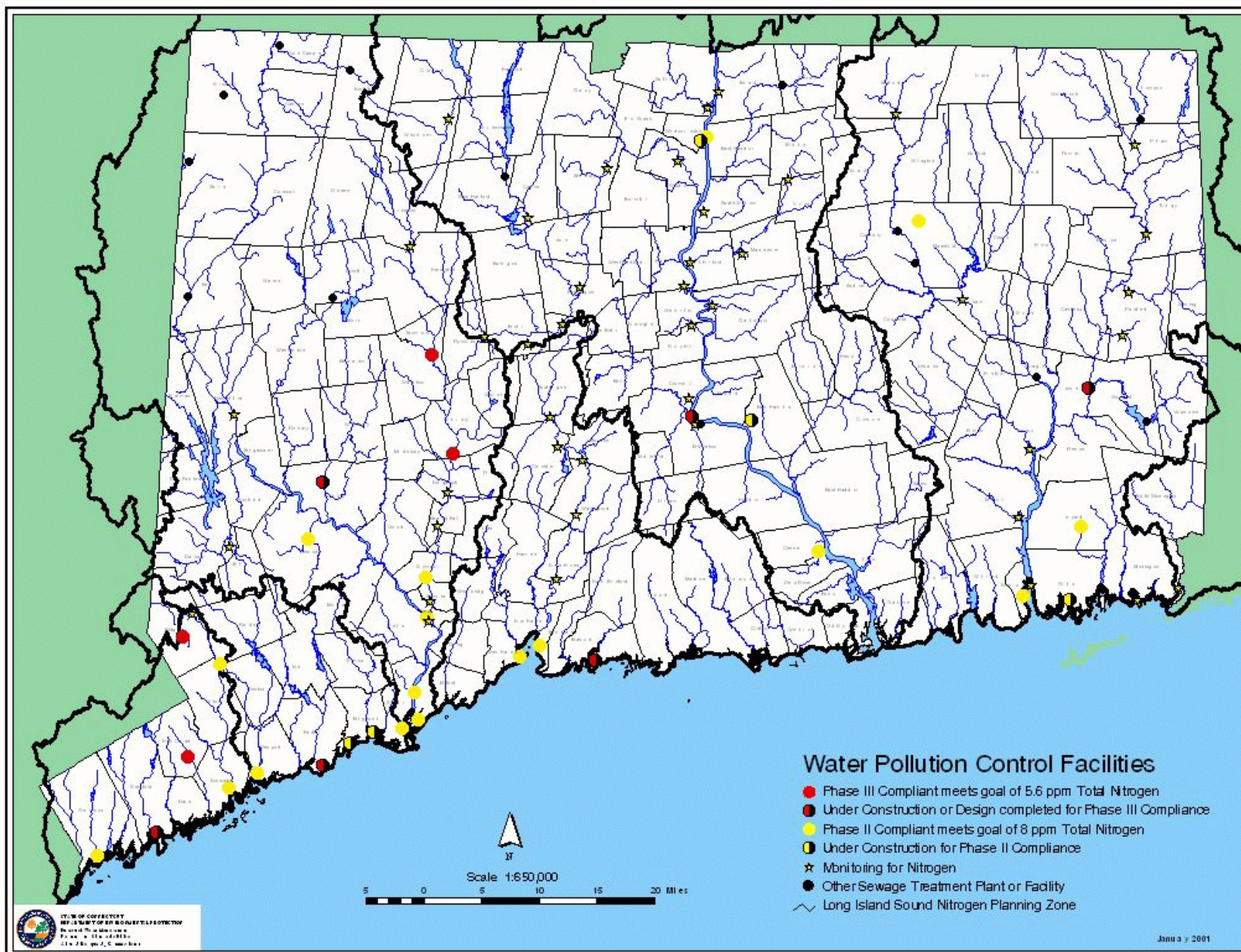


Figure 3

SUMMARY OF CCMP MANAGEMENT ACTIONS: HYPOXIA

H-1. REDUCING NITROGEN FROM SEWAGE TREATMENT PLANTS AND OTHER POINT SOURCES (CCMP TABLE 4, P. 32)

Key Elements: The states of Connecticut and New York committed to reducing nitrogen loads throughout the Long Island Sound basin using a mixed approach of retrofits, pilot studies and upgrades under existing permitting authorities. With adoption of the TMDL, state requirements to remove nitrogen loads will be formalized and expanded well beyond the commitments specified in the CCMP. In anticipation of TMDL adoption, the states have been using a variety of legal, voluntary, and funding mechanisms to promote nitrogen removal from point sources, with considerable success.

Description	2001 Planned Action
The total estimated point source load to LIS in 2000 is 157,631 lbs./day, a decrease of over 29,000 lbs/day from 1990 levels. New York loadings totalled 109,518 lbs/day; Connecticut loads totalled 48,113 lbs/day.	Continued emphasis on TMDL targets.
In Connecticut as of December 2000, 19 municipal sewage treatment plants have completed nitrogen removal projects totalling nearly \$251 million, e.g., Derby, CT -- an aeration modification and upgrade for nitrogen removal (to less than 8 mg/l) was completed July 2000; Waterbury, CT -- the new Waterbury municipal sewage treatment plant was completed on April 30, 2000. The nitrogen concentration of the new plant's effluent, to the Naugatuck River, is anticipated to be 4 mg/l, about a 75% reduction from previous nitrogen concentrations	Continue to assist municipalities with upgrades to STPs. The Portland and New London STPs are scheduled for completion of nutrient removal upgrades in 2001. Groton is expected to begin construction of nitrogen removal upgrades in 2001 utilizing \$17 M in state funding. Anticipated completion of the Fairfield STP by the end of 2001.
5 municipal STPs currently have nitrogen removal upgrades in progress totalling nearly \$80 million, e.g., Branford, CT -- facility planning and design have been completed and construction of the facility upgrade was begun in February 2000; Fairfield, CT -- began construction of nitrogen removal upgrades and was awarded an additional \$8,118,067 grant and loan from the CT Bond Commission bringing the total bond funding for this project to over \$41.2 M.	
6 municipal STPs are currently under design for nutrient removal with design grant costs totalling over \$116 million.	
New York City is completing a comprehensive watershed management plan for the East River to address continuous sewer overflow impacts on the East River and Western Long Island Sound.	
The Village of Great Neck Sewer District and Great Neck Water Pollution Control District are conducting an engineering feasibility study to evaluate diversion of current flows outside the Long Island Sound Basin.	
NYCDEP has completed an evaluation of nitrogen control feasibility alternatives for all East River water pollution control plants.	
Westchester County, using \$3.8 million in Clean Water/Clean Air Bond Act Funds, will begin construction of a full scale nitrogen control demonstration project at the Mamaroneck Sewer District employing high biomass technology.	
Belgrave Sewer District, with assistance of \$110,000 in Clean Water/Clean Air Bond Act Funds will install upflow fluidized bed technology to evaluate treatment of effluent from a trickling filter facility.	
New York and Connecticut have conducted training programs for sewage treatment plant operators to optimize existing treatment facilities nitrogen removal capabilities.	
NYSDEC has modified NPDES permits for New York City, Westchester, Nassau, and Suffolk county dischargers to limit discharges of nitrogen to 1990 load levels.	
NYCDEP has implemented control at Upper East River facilities to reduce loads to below 1990 levels. <ol style="list-style-type: none"> 1) Separate centrate treatment at Wards Island, Hunts Point, and Bowery Bay. 2) Basic Step Feed BNR at Bowery Bay, Tallman Island, Hunts Point, and Wards Island. 3) Increased sludge age at Wards Island. (Total cost of these improvements exceeds \$11,000,000. Grants from the Clean Water/Clean Air Bond Act totaling \$3.8 million will assist NYCDEP)	

Description	2001 Planned Action
<p>Clean Water/Clean Air Bond Act grants in the following amounts have been provided to the following to construct new nitrogen removal facilities:</p> <p>Glen Cove, \$3.3 million; emergency construction started in 2000.</p> <p>Huntington Sewer District, \$3.24 million</p> <p>Oyster Bay Sewer District, \$3.7 million</p> <p>Kings Park Sewer District, \$3.152 million</p> <p>Village of Northport, \$977,50</p> <p>Town of Huntington, Huntington Sewer District, \$5.682 million</p> <p>Suffolk County DPW, Port Jefferson facility, \$3.048 million</p> <p>NYC \$30.828 million for phase I upgrade of the Hunts Point STP.</p> <p>Port Washington Water Pollution Server District, \$222,000 to convert existing tankage to create nitrification/denitrification zones to demonstrate nitrogen removal at this trickling filter facility</p>	<p>Major construction to start in 2001. Construction should commence in calendar year 2001.</p> <p>Construction should commence in calendar year 2001</p>
<p>NYC is required to rebuild and upgrade its Newtown Creek Facility in the Lower East River to denitrify the effluent and provide at least 50% reduction of influent nitrogen.</p>	<p>The project will cost over \$1.0 billion</p>

H-2. REDUCING NITROGEN LOADS FROM NON-POINT SOURCES (CCMP TABLE 5, P.34)

Key Elements: The states of Connecticut and New York have broad authorities to manage nonpoint sources of pollution and have agreed in the CCMP to emphasize control of nitrogen in ongoing state and federal programs. These include state nonpoint source programs (CWA Sec. 319), the coastal nonpoint source control program (CZARA Sec. 6217), and stormwater permitting programs. Most of the site specific studies and activities identified in the CCMP have been completed. The states have committed to using nonpoint source control programs to begin the difficult task of reducing nonpoint sources of nitrogen and anticipate continuing those efforts as the primary means to meet the reduction goal specified in the TMDL upon adoption. In addition to the regulatory and funding programs, the states have made commitments to promote essential technical assistance and training programs through NRCS and NEMO as well as agency watershed and nonpoint programs that have become widespread since development of the CCMP.

Description	2001 Planned Action
<p>Nonpoint sources of nitrogen cannot be easily monitored and are subject to wide variations depending on weather conditions, especially rainfall. Rough approximations of nonpoint source nitrogen loads have been constructed using a mix of stream monitoring data and export estimates based on land cover. These data show the 1999 nonpoint nitrogen load to be about 28,000 tons/yr, about 9,000 tons below the highest load over the last decade in 1991 of 37,000 tons/yr.</p>	<p>The LISS plans to revise these estimates using a USGS report to be released in 2001.</p>
<p>The LISS provided a fourth year of funding in FY00 to the University of Connecticut/Cooperative Extension System (UConn/CES) to continue its Nonpoint Education for Municipal Officials (NEMO) program in Long Island Sound coastal tributary watersheds. The scope of the program, which originally was targeted at the seven towns in the Norwalk River watershed, then expanded to include towns and watersheds in other parts of Fairfield County and in Westchester County, NY, focused primarily on assisting the NY Sea Grant Program establish a counterpart NEMO program on Long Island. project.</p> <p>In 2000, the NEMO program was expanded to include a new coordinator and office in SUNY Stony Brook, New York. The New York NEMO program is working with the Hempstead Harbor and Manhasset Bay Protection Committees in briefing local boards and commissions and in conducting two basic NEMO workshops for municipal officials in those communities. In three and a half years, the LIS NEMO program has conducted 110 workshops reaching more than 2400 participants in approximately 30 communities. The LISS provided a total of \$194,000 in FY96 and FY98-00 to support the Long Island Sound NEMO</p>	<p>Continued LISS support for NY NEMO in FY2001 was approved by the Management Committee.</p>
<p>The LISS continued to provide staff support to the Norwalk River Watershed Initiative. Implementation of the Norwalk River Watershed Action Plan is being guided by the Norwalk River Watershed Advisory Committee, with representatives from EPA, the USDA Natural Resources Conservation Service (NRCS), CT DEP, the seven watershed communities, several citizen groups, and area residents. From FY98-01, EPA awarded \$340,000 in Clean Water Act section 319 funds to support several high priority implementation activities, including hiring a "watershed coordinator" (in February 2000), riparian buffer restoration, stormwater management, road sand/salt reduction, and septic system outreach and education.</p>	<p>Continued LISS support for the NRWI in FY2001.</p>

Description	2001 Planned Action
CTDEP expanded its Watershed management program in 2000 by filling 5 watershed coordinator positions within the Bureau of Water Management Planning and Standards Division.	Work with other watershed stakeholders to plan and implement watershed management activities.
Currently CTDEP is implementing 104 active §319 projects from FY94-2001 grants. Twenty four (24) new projects were funded under §319 for the year 2000 and 12 projects were closed out.	
CTDEP completed a §104(b)(3) watershed modeling project in December 2000. Section 104(b)(3) funds were utilized to develop a Long Island Sound watershed model, similar to that used by the Chesapeake Bay Program, to guide nonpoint nitrogen and watershed management in general. CT DEP contracted to develop a watershed model that will serve to (1) assess nonpoint source contributions of nitrogen, phosphorus, and carbon to Long Island Sound, and (2) assist CT DEP in managing these nutrients to reduce hypoxia. Last year, CT DEP contractors completed the LIS Watershed Model and presented their preliminary findings at the 2000 National Monitoring Projects Symposium in Connecticut.	A final report is due in 2001. CTDEP will make the modeling report available to environmental managers and professionals.
NYSDEC is providing funding support to Westchester County to conduct a special monitoring project to measure nonpoint source and tributary loads from Westchester County.	
NYSDEC completed a report which evaluated nonpoint source nitrogen loads to LIS from Nassau and Suffolk Counties.	
Westchester County Department of Planning, with funding support from NYSDEC, is continuing to develop watershed management plans for Westchester County (Zone 7). Watershed Advisory Committee 4 completed a draft management plan for the Sheldrake and Mamaroneck rivers and Mamaroneck Harbor.	Finalize WAC 4 management plans.
In 2000, the Suffolk County Department of Health, with funding support from NYS DEC began preparation of a Suffolk County Watershed Management Plan for Suffolk County (Zone 11).	
NYSDEC is working with the coalition of Nassau County dischargers to develop a work program for the development of a watershed management plan for Nassau County Zone (10).	
Local watershed planning efforts for Hempstead Harbor and Manhasset Bay, led by local municipalities, continued in 2000.	

H-3. CONTINUING MANAGEMENT OF HYPOXIA (CCMP TABLE 6, P. 39)

Key Elements: The actions specified in the CCMP primarily reference research, monitoring and modeling activities and the use of that information and those tools to improve understanding and management of hypoxia in the Sound. Much progress has been made in this area to provide the scientific basis for the TMDL and the TMDL specifies the implementation steps recommended in the CCMP to control hypoxia. Finally, the action to continue appropriate modeling and research and periodically review management plans is central to the adaptive management approach promoted in the TMDL.

Description	2001 Planned Action
A series of Public Informational Meetings for the WLA were held in Connecticut and in New York in 2000.	Begin implementation of TMDL.
The final TMDL with WLA was completed by the states and submitted to EPA in early 2001.	
EPA, CTDEP, NYSDEC and NYCDEP continued to address the System-Wide Eutrophication Model (SWEM) as a successor to the LIS 3 model. The agencies met in 2000 several times to review information and data collected as part of the refinement process.	A final agreement on the use of the SWEM is expected in 2001. The management conference provided funds in the FY2001 LISS budget for additional SWEM work.

H-4. FUNDING TO IMPLEMENT HYPOXIA MANAGEMENT PLANS (CCMP TABLE 7, P. 41)

Key Elements: The intentions of the CCMP actions were to fully fund existing nonpoint source (CWA Sec. 319 and CZARA 6217) programs, have states supplement state revolving fund programs, and to appropriate additional federal funds for management, emphasizing the Phase III management efforts incorporated in the TMDL.

Description	2001 Planned Action
In 1996-2000, CT committed \$390 million for sewage treatment plant reconstruction projects that will benefit LIS and estimates that Clean Water Funding will be adequate to finance Phase III upgrade requirements. In CT the 2000 funding was \$37.9 million. Total CT funding through 2000 including all completed projects, projects still under construction, and projects still in the design phase totals over \$447 million.	For 2001 the CT Bond Commission approved over \$11.6 M in grant & loan for design and upgrades to STPs for advanced nitrogen removal.

H-5. MONITORING AND ASSESSMENT OF HYPOXIA (CCMP TABLE 8, P. 4)

Key Elements: The CCMP recognized the importance of continuing and expanding monitoring efforts to answer fundamental questions on the health of LIS and to identify trends and changes that may be related to management activities. Most of the recommended monitoring was to be directed towards oxygen and nutrients because of the hypoxia problem in LIS. In addition, several specific monitoring/research projects were listed, most of which were completed shortly after the CCMP was released. Lobsters were identified for special attention because of disease problems that pre-date the recent lobster die-off in western LIS. The CCMP also recommended EPA complete their dissolved oxygen criteria report to be used by the states to develop new criteria, if appropriate.

Description	2001 Planned Action
<p>The LISS partners continued ambient monitoring of LIS in 2000. NYCDEP performed ambient monitoring of NY waters in western LIS. IEC continued its summer hypoxia monitoring in LIS by collection and weekly measurements of DO, temperature, salinity, chlorophyll a at 21 stations; at a subset of stations, samples were collected for phytoplankton and pfiesteria</p> <p>During the summer of 2000 CTDEP's LIS ambient water quality monitoring program took part in the EPA's National Coastal Assessment (or Coastal 2000) program. Along with the usual water quality parameters taken by the program, sediment samples were collected once from half of the fixed (sampling point) stations in LIS. In September 2000, the CT DEP produced its <i>Summer Hypoxia Monitoring Survey 1991-1998 Data Review</i>, an 84 page summary of 8 years of LIS water quality monitoring by CTDEP.</p>	In the summer of 2001 the CT DEP will continue to participate in the National Coastal Assessment by recording usual water quality parameters and collect sediment samples from the other half of the fixed (sampling point) stations in LIS.
<p>Hypoxic conditions in LIS were estimated to have extended for a period of 35 days and to cover a maximum area of 171 square miles. This compares favorably with the 14 year averages of 56 days and 206 square miles.</p>	Continued ambient monitoring of LIS.
<p>EPA published the <i>Ambient Aquatic Life Water Quality Criteria for DO (Saltwater): Cape Cod to Cape Hatteras</i>, EPA-822-R-00-012, November 2000.</p> <p>CTDEP proposed a revision to its water quality criteria for DO based on the EPA criteria document.</p>	EPA approved and DEP adopted new DO criteria for saltwater in 2001.
<p>The University of Connecticut Department of Marine Sciences at Avery Point, Connecticut, continued to operate and maintain its real-time water quality monitoring network, MYSOUND through the third year of a three-year EPA grant under the EMPACT (Environmental Monitoring for Public Access and Community Tracking) program. The MYSOUND project added monitoring stations in the Western Sound, maintained by the Indian Harbor Yacht Club and Hempstead Harbor, maintained by the Coalition to Save Hempstead Harbor. The MYSOUND stations monitor surface and bottom waters for dissolved oxygen, temperature, salinity and selected other parameters at specific sites. The MYSOUND website address is: http://www.mysound.uconn.edu.</p>	The LISS will fund an additional year of MYSOUND monitoring in FY2001.